



# In-situ monitoring of water quality in South San Francisco Bay



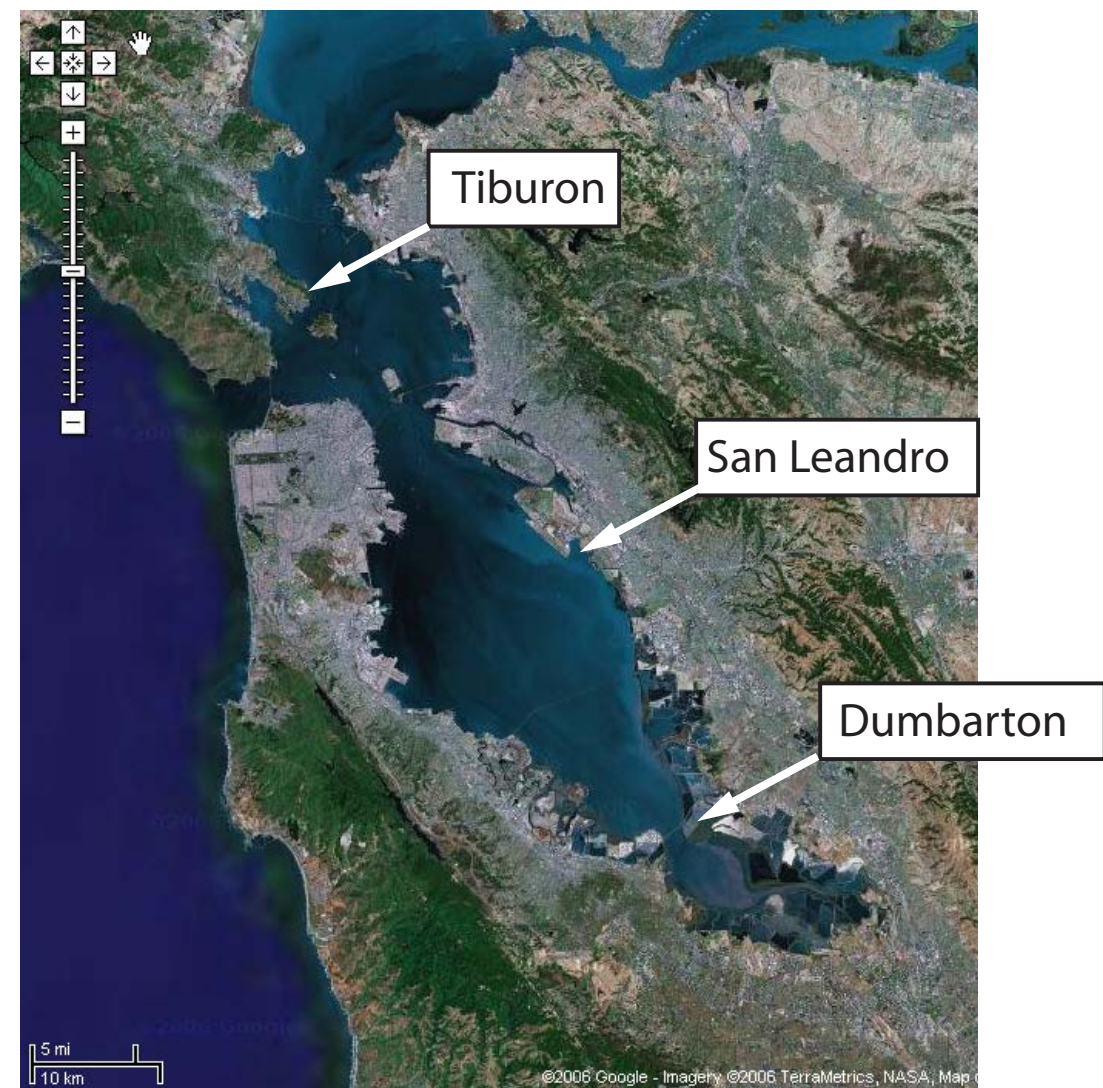
Craig, M., Andrews, J., Barnett, B, Dare, C., Yang, D. (CSU East Bay)

Schemel, L. (USGS)

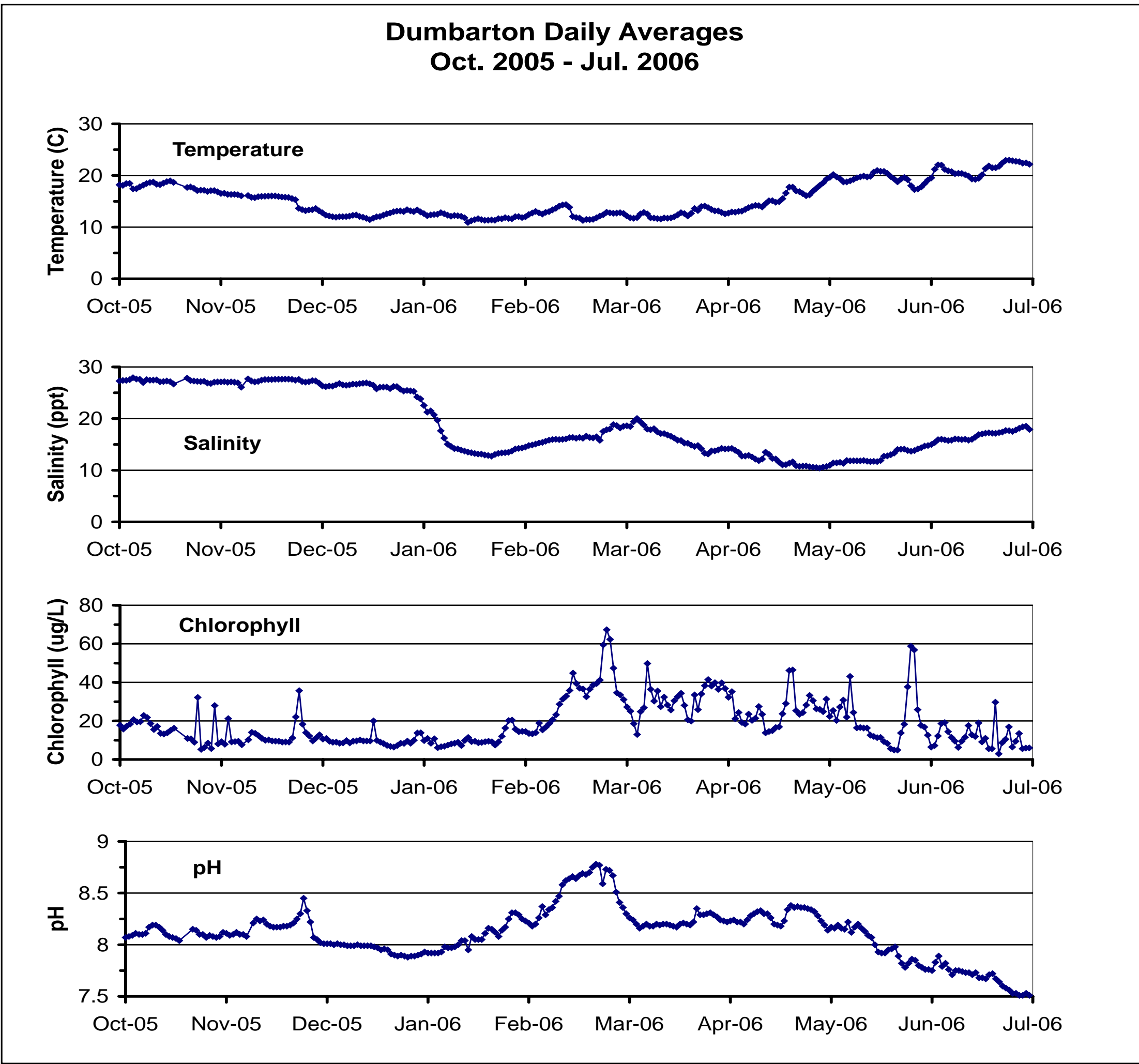
Contact: mitchell.craig@csueastbay.edu

## ABSTRACT

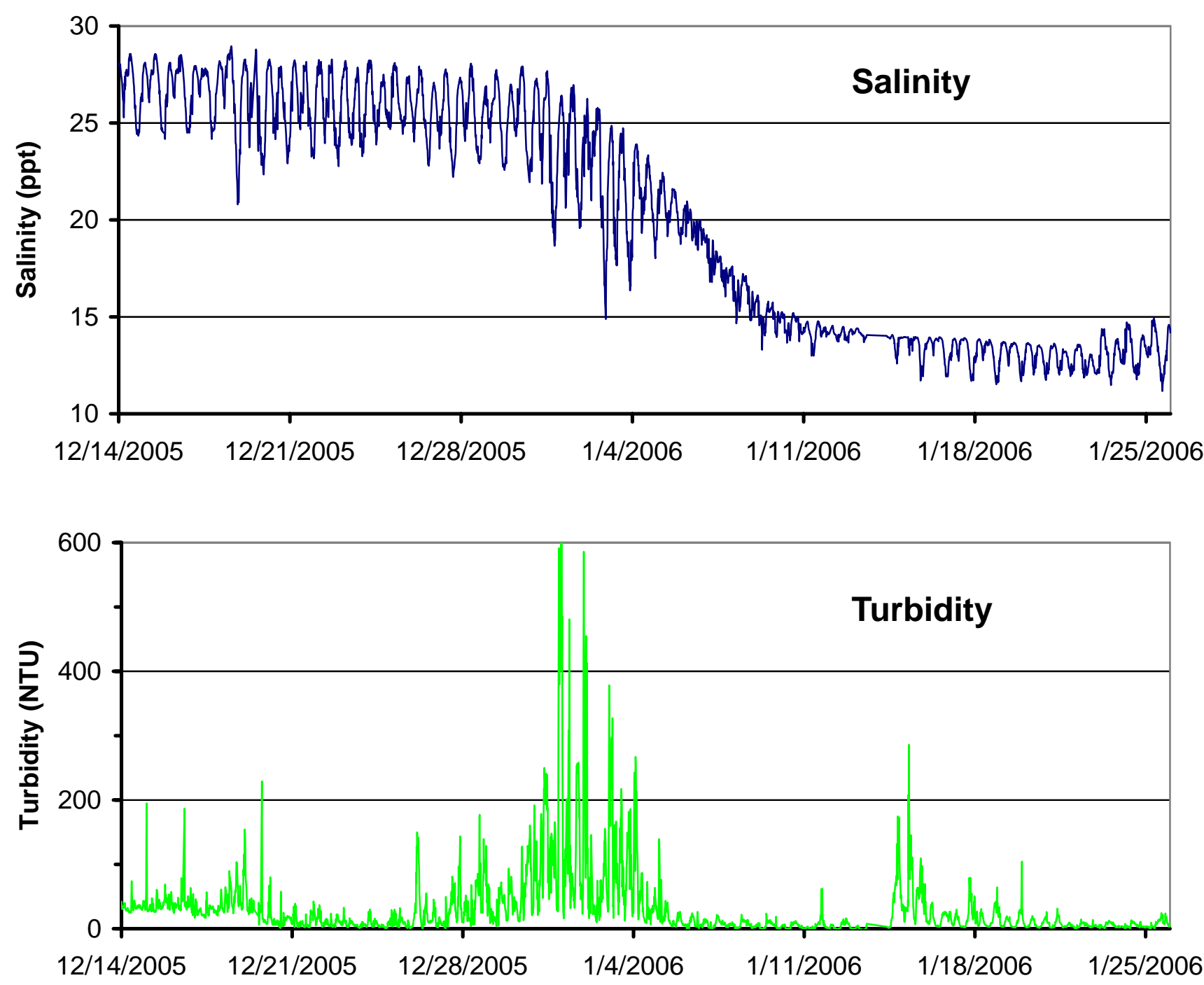
We installed continuous-recording water-quality monitoring sondes at two locations in South San Francisco Bay in summer 2005 to enhance existing monitoring capabilities. The new instruments record temperature, salinity, turbidity, fluorescence, dissolved oxygen, tidal level, and pH. Data are posted on the web at [www.csueastbay.edu/cicore](http://www.csueastbay.edu/cicore). One of the instruments is located at Dumbarton Pier, where water-quality data have been recorded since 1989. The new instrument at Dumbarton is deployed at a mean water depth of 5 m, at a fixed distance of 1 m above water bottom. Combined with data from an existing surface deployment at the same location, the new data enable us to examine stratification and destratification processes related to tides, winds, and freshwater inflow. The other new instrument is located at San Leandro Marina, deployed near the water surface. The instruments are cleaned in the field every 3 weeks, and returned to the laboratory every 6 weeks for calibration and more extensive cleaning. The new sondes utilize automatic wipers to inhibit biofouling. Stations are serviced more frequently during the summer months, when biofouling is most severe. Samples of bottom sediments were collected in spring 2006 in the vicinity of the instruments and analyzed for particle size distribution using a laser-diffraction instrument. Bottom sediment is primarily silt and clay, with the exception of occasional coarser deposits of shell fragments. Water samples are collected at the station locations every 3 weeks for more accurate determination of salinity in the laboratory. Periods of high rainfall, primarily during winter, coincide with lowered salinities and turbidity pulses at the Dumbarton station. Fluorescence and dissolved oxygen data provide baseline data for evaluating the effects of wetlands restoration projects that are currently underway in the South Bay



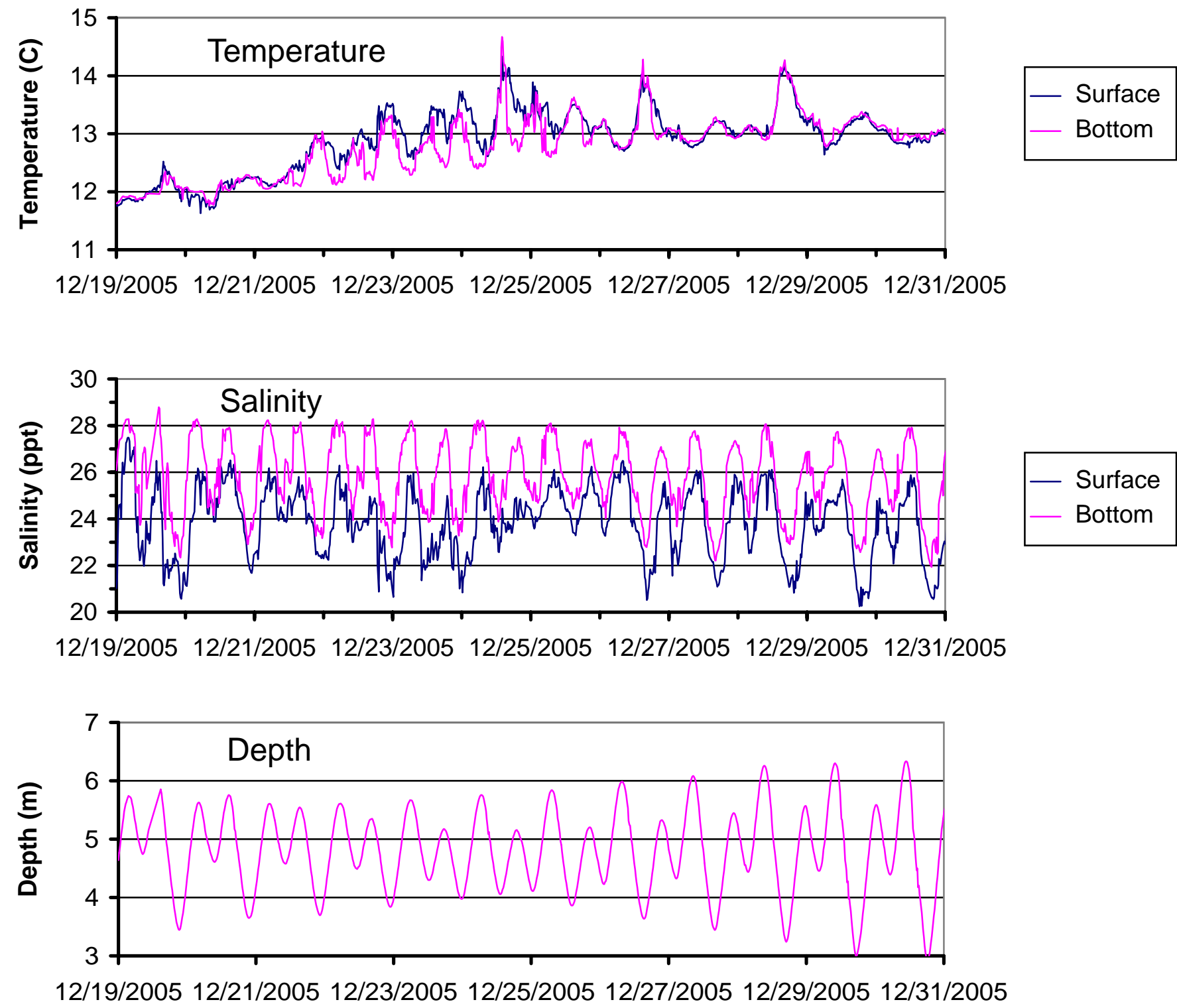
San Francisco Bay CICORE Sonde Locations  
(Map courtesy of Google Maps)



Major rainfall event and freshwater input to Bay, note turbidity pulse and salinity decrease (15-minute sample interval, Dumbarton).



Stratification and destratification of temperature and salinity, measured using surface and bottom sondes (15-minute sample interval, Dumbarton).



### Data Editing

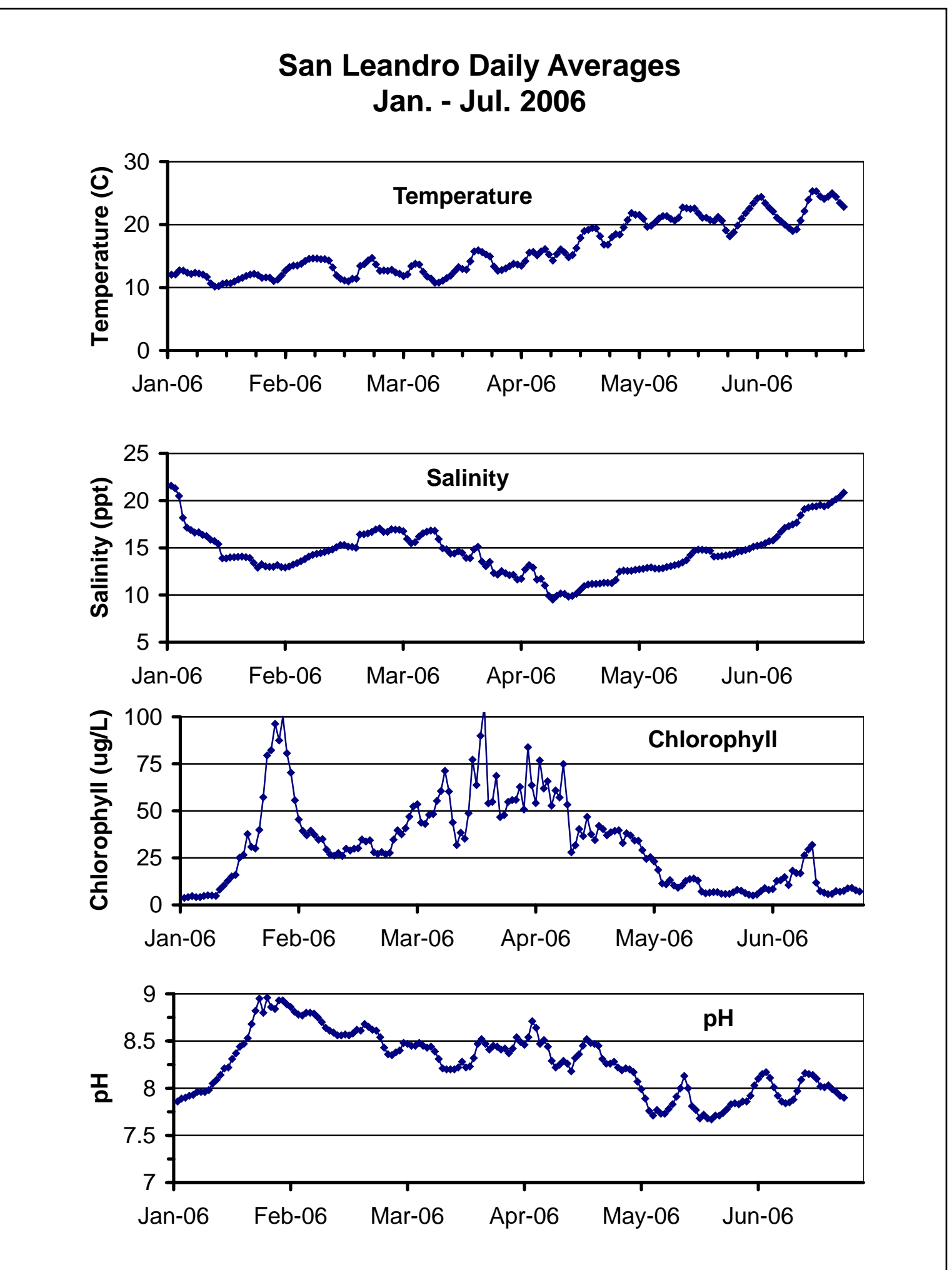
Limits test: compare each value against minimum and maximum.  
Spike removal: compare each value against 5-point moving average.

Median filtering: compute 5-point weighted average:

$$\bar{x}_i = \frac{x_{i-2} + 2x_{i-1} + 3x_i + 2x_{i+1} + x_{i+2}}{9}$$

Compare original data vs. moving average:

If  $\frac{|x_i - \bar{x}_i|}{\bar{x}_i}$  exceeds threshold (usually 0.7 - 1.0), reject value.



San Leandro deployment. Black tube contains sonde, gray box contains data acquisition system and CDMA cellular modem. Sonde sampling interval is 6 minutes, data is retrieved by modem every hour.



Instrument shed at Dumbarton site, located on Dumbarton pier.



Instrument mounting carriage and float for surface sonde, Dumbarton site.



Bottom sonde, Dumbarton site.